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Changes of the prevalence of adolescent mental problems during the last decade (2003-2013)

MASTER`S THESIS

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ABSTRACT

Background*:* Repeated cross sectional studies afford a possibility to get information of time trends of mental problems owing to the standardized questionnaires in different time points. Results of a systematic review of studies of adolescent mental health problems made by repeated cross sectional studies are reported in this systematic review.

Method: Results of a systematic literature review in the field of adolescent mental health are presented. The age group initially included was 12-22 years old. Exemplary studies of specific mental disorders are used for comparison and gaining some insight of coherence of the evidence.

Results*:* There is not clear evidence of changes in adolescent mental health during the last ten years. On the basis of these results it cannot be surely concluded if such changes ever happen in the large international scale. Still these results report regional differences in directions of changes and interesting differences between girls and boys, which may be explicable with regional, cultural and socioeconomic trends influencing differently on boys and girls.

Conclusions: The dependence of definitions of mental health phenomena on cultural values and appreciations and the fundamentally social and communicative process of defining mental health and mental problems has resulted in the lack of objective methods to measure mental health. It looks unrealistic to expect that MRI (Magnetic resonance imaging) could provide research with objective measures of mental health in near future, because latest research has shown how even diverse cognitive, even short term, processes can produce alterations detectable by MRI in normal subjects.

Keywords: Mental health**,** adolescents, repeated cross-sectional studies, systematic review, trends

TIIVISTELMÄ

Tausta: Toistetut poikkileikkaustutkimukset standardisoiduilla kyselylomakkeilla antavat mahdollisuuden saada tietoa mielenterveysongelmien ajallisesta kehityksestä. Tässä systemaattisessa katsauksessa raportoidaan tulokset nuorten mielenterveysongelmien toistomittausten systemaattisesta katsaustutkimuksesta.

Menetelmät: Tässä esitetään tulokset systemaattisesta kirjallisuuskatsauksesta nuorten mielenterveyden erikoisalalta. Mukaan otettu nuorten ikäryhmä oli 12-22 vuotiaat. Esimerkin omaisia nuorten mielenterveyden erikoisalueiden tutkimuksia käytetään vertailuaineistona ja jonkinlaisen käsityksen saamiseksi tulosten johdonmukaisuudesta.

Tulokset: Tulosten mukaan ei ole selvää näyttöä nuorten mielenterveyden muutoksista viimeisten kymmenen vuoden aikana. Näiden tulosten pohjalta ei voida myöskään päätellä, tapahtuuko tällaisia muutoksia ylipäänsä lainkaan laajassa kansainvälisessä mittakaavassa. Toisaalta tulosten mukaan muutosten suunnissa on alueiden välisiä eroja. Lisäksi tyttöjen ja poikien välillä on mielenkiintoisia eroja, jotka saattavat olla selitettävissä eri tavoin tyttöihin ja poikiin vaikuttavilla alueellisilla, kulttuurisilla ja sosioekonomisilla muutoksilla.

Johtopäätökset: Mielenterveysilmiöiden riippuvuus kulttuurisista arvoista ja arvostuksista sekä mielenterveyden ja mielenterveysongelmien määrittelyprosessin pohjimmiltaan sosiaalinen ja kommunikatiivinen luonne ovat johtaneet objektiivisten mittareiden puuttumiseen. Näyttää epärealistiselta odottaa MRI:n (magneettinen resonanssikuvantaminen) kykenevän lähitulevaisuudessa tarjoamaan tutkimukselle objektiivisia mittareita, koska viimeisin tutkimus on osoittanut hyvin moninaisten kognitiivisten, jopa lyhyt kestoisten, prosessien voivan tuottaa MRI:llä havaittavia muutoksia tutkittavissa henkilöissä.

Avainsanoja: Mielenterveys, nuoret, toisto-poikkileikkaustutkimukset, systemaattinen katsaus, muutokset

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1.INTRODUCTION

1.1 Background

Research indicates that up to 20% of adolescents experience mental health problems in the world (Kieling et al 2011, Bor et al 2014,). Although the very high prevalence of the mental problems is generally recognized, according to Flett and Hewitt (2013) the prevalence of adolescent mental problems is generally underestimated because the subclinical symptoms remain neglected and a subgroup of adolescents tries to look perfect to outsiders. The purpose of this study is to make a systematic review of repeated cross sectional studies of adolescent mental health aged 12-22 years during years 2003-2013. The aim was to find if there have been secular changes in mental health. The methods of collecting information in included publications have been mail questionnaires or interviews, but in principle it is nowadays possible collect information by internet, too. In fact Friberg et al (2012) have done this kind of study, but their time interval is only 3 years, which may be a little bit too short for detecting secular changes and that`s why it is not included this review.

1.2 Definition of mental health

Like health, mental health is not an easily definable phenomenon. For example aggressiveness is an adaptive property in some circumstances in the evolutionary perspective (Mysterud and Poleszynski 2003), but modern environmental conditions -lack of nutrients, allergens, heavy metals- may lower the barrier for aggressive behavior or influence on the brain by increasing behavioral disorders. On the other hand perceptions of what is illness and what is normal or healthy are often constructed in the social discourse, where laymen have a significant role, too (eg. Young (2011) alcoholism as an example). There is also considerable variation in the use of

concepts: for example the difference between psychosomatic symptoms and psychic problems looks partly obscure in the literature.

Concepts regarding asocial behavior are also varying in cultures according to the age group of the representative in question (Morgado and Luz Vale-Dias 2013): what is normal in children is not it always in adolescents and vice versa. According to Judd (1986) mental health as the opposite of mental disease is the most common definition used, but he argues with Szaz (1961, in Lowe (1976) as in Judd (1986)) that neither a negative or positive definition of mental health is appropriate, as both are only reflections of cultural values. What is defined as healthy in one culture may be defined as illness by another culture. As Szaz (1961) states , “definition entails … a covert comparison or matching of the patient`s ideas, concepts and, or beliefs with those of the observer and the society in which they live (Lowe(1976), Judd (1986)).” As a newer reference, the newly updated version of the largely internationally appreciated Diagnostic and Statistical Manual of Mental Disorders of the American Psychiatric Association, DSM-5 (American Psychiatric Association 2013), argues “The boundaries between normality and pathology vary across cultures for specific types of behaviors. Thresholds of tolerance for specific symptoms or behaviors differ across cultures, social settings, and families. Hence, the level where at which an experience becomes problematic or pathological will differ.“ They also argue that “although no definition can capture all aspects of all disorders in the range contained in DSM-5, the following elements are required: A mental disorder is a syndrome characterized in an individual`s cognition, emotion regulation, or behavior that reflects a dysfunction in the psychological, biological, or developmental processes underlying mental functioning. Mental disorders are usually associated with significant stress or disability in social, occupational, or other important activities. An expectable or culturally approved response to a common stressor or loss, such as the death of a loved one, is not a mental disorder. Socially deviant behavior (eg. political, religious, or sexual) and conflicts that are primarily between the individual and society are not mental disorders unless the deviance or conflict results from dysfunction in the individual, as described above” (American Psychiatric Association 2013).

In this thesis mental disorder is defined as any behavioral trait, which is producing harm to the person expressing it or to his environment. Still, interaction between researchers, possible interviewers and respondents, like in repeated cross sectional studies in this review, confirm broadly with Szaz`s (1961) and DSM-5 (2013) definitions, too. Because concepts are clearly vague in mental health, it is challenging to make exact statements of the subject.

It is important to realize a distinction between diagnosed mental disorders and mental problems defined in another way, eg. by cross sectional, epidemiologic questionnaire studies, which are the topic of this review. Whichever the method to diagnose mental disorders, there is no consensus whether the categorical system of diagnosis is useful for diagnosing (Trull and Durrett 2005) eg. personality disorders. According to Bearden et al (2009), for mental illness, there is considerable interest in identifying quantitative assessments, which may provide a more objective basis for rating psychopathology. They point this to facts no biological assays are currently available, the phenotypic features are usually assessed by subjective ratings, and individuals are assigned a diagnosis on report of symptoms, no one of which is present in all individuals assigned that diagnosis. According to Klein et al (2006) there is substantial comorbidity between depressive disorders and other forms of psychopathology. It is not unproblematic to separate symptoms of psychic disorders from the normal inconveniencies and misfortunes of everyday life, too (eg. Wakefield 2007).

There are also strong critics against the use of diagnostic systems like DSM-5 in scientific literature. According to Timimi (2014) for a diagnostic system to establish itself as clinically useful it should show that use of diagnostic labels aids treatment decisions in a way that impacts on outcomes, but there is little evidence to support the position. There is much evidence to suggest that instead, they can cause significant harm. The only evidence-based conclusion therefore is that formal psychiatric diagnostic systems like ICD and DSM should be abolished (Timimi 2014). This can obviously be interpreted that there are not applications for psychiatric diagnostic systems and that`s why they lack strong evidence of the correctness of scientific theory of the area.

1.3 Processes influencing on mental health in adolescence

According to Smetana et al (2006) most researchers have parsed adolescence into three developmental periods, entailing early adolescence (typically ages 10–13), middle adolescence (ages 14–17), and late adolescence (18 until the early twenties). It is commonly said that adolescence begins in biology and ends in culture, because the transition into adolescence is marked by the dramatic biological changes of puberty, while the transition to adulthood is less clearly marked. Transitions to adulthood have been defined sociologically in terms of marriage and family formation, completion of education, and entrance into the labor force (Smetana et al 2006).

Mental health, if any area of health, is a product of complex social, psychological and biological interactions. Both because of biological maturation and the determination of later educational and job career, adolescence is a stage of remarkable importance for both the youth them shelves and for the society. The importance of peers is increasing in opposition to the relationships with parents while the importance of school also is central. Adolescence is important for the determination of identity, too (Smetana et al 2006).

According to neurobiological studies, which are still in their infancy, it is supposed, that alcohol, cigarette and drug use are especially harmful in adolescence, because important reorganizations like diminution of grey matter and intensification of synaptic connections by selection and pruning occur (eg. Jacobsen et al 2005, Bossong and Niesink 2010, Guerri and Pascual 2010). According to Kearney (2008) one central risk factor for violence, accidents, driving car under alcohol, drug use, psychiatric disorders and economic problems is school absenteeism, which probably describes well the multidimensionality of the field, although it does not tell much of causal relations.

Environmental factors can be both predisposing and protective of mental problems. Genetic factors, even single genes, have their deal as determinants of mental health although

often in interaction with the environment. According to Viner et al (2012) the following are biological and socialization processes in adolescence that allow unique opportunities for social determinants to affect health: 1) Central nervous system and health itself, 2) adoption of behaviors that are risky to health yet might be normal within adolescent social development, and 3) life stage transitions and changes in personal and social responsibilities entailed. The World Bank Development Report 2007 outlined the following five transitions and changes (Viner et al 2012): 1) transition from primary to secondary schooling and from secondary to higher schooling, 2) transition from education into workforce, 3) transition to responsibility for own health, 4) transition from family living to autonomy, early marriage and parenthood and 5) transition to responsible citizenship. This is an example of the participation of social (and global) institutions on the defining of mental health, too.

According to Schepman et al`s (2011) cohort study parental and adolescent emotional problems were significantly associated in their both samples. Longitudinal analyses of their first cohort showed that parental emotional problems in adolescence predicted offspring adult mental health (which is main concerns in adolescent behavior and emotional disorders), even when controlling for prior offspring psychopathology and for family adversity in adolescence. Because the study was not genetically sensitive, the influences of shared genes that might affect risk for parental emotional problems in adolescence and adult offspring mental health could not be ruled out. However (Schepman et al 2011), twin and adoption studies have shown that in addition to modest heritable components, there is also strong evidence for environmental links between parental and offspring depression and anxiety (Silberg et al 2010; Tully et al 2008). For example according to Renefolt and Evensen (2000) unemployment increases the risk of mental health problems, because economic problems, feelings of shame and poor social support increase the likelihood of psychological distress (and these are, of course, important factors for the quality of adolescent family environment).

Curtis et al (2013) have recently critically reviewed neighborhood risk factors for common mental disorders among young people aged 10-20 years. They interpreted neighborhood factors as attributes and processes in the local social and physical environment that young people inhabit beyond the immediate household. They concluded that a large, growing, multi-disciplinary literature is suggestive of a link between risk of common mental disorder for young people and

neighborhood problems of material poverty, poor living conditions and social stressors such as violence and victimisation. However, there are limitations in much of the empirical research evidence reviewed (Curtis et al 2013). It proved difficult to define automated search terms that efficiently identified relevant research meeting their inclusion criteria, especially as the neighborhood processes of interest are complex and difficult to summarize in terms of very specific causal pathways. Web of Science was according to them more adapted than Medline and PsycInfo to search fields relating to neighborhood terms. The limitations of the research reviewed stem partly from the ways that 'community' or 'neighborhood' environments are operationalized (restricted to small administrative areas or to the young person's school, for example). There is little evidence of a 'multi-scalar' approach, considering how wider regional or national conditions may interact with local circumstances. According to them (Curtis et al 2013) it seems plausible that neighborhood processes work rather differently in urban compared with rural areas (Marsella 1998), but it is very unusual for research they reviewed to explicitly consider urban/rural differences. Their theoretical framework is presented in FIGURE 1 as one example how to describe factors influencing on adolescent mental health.

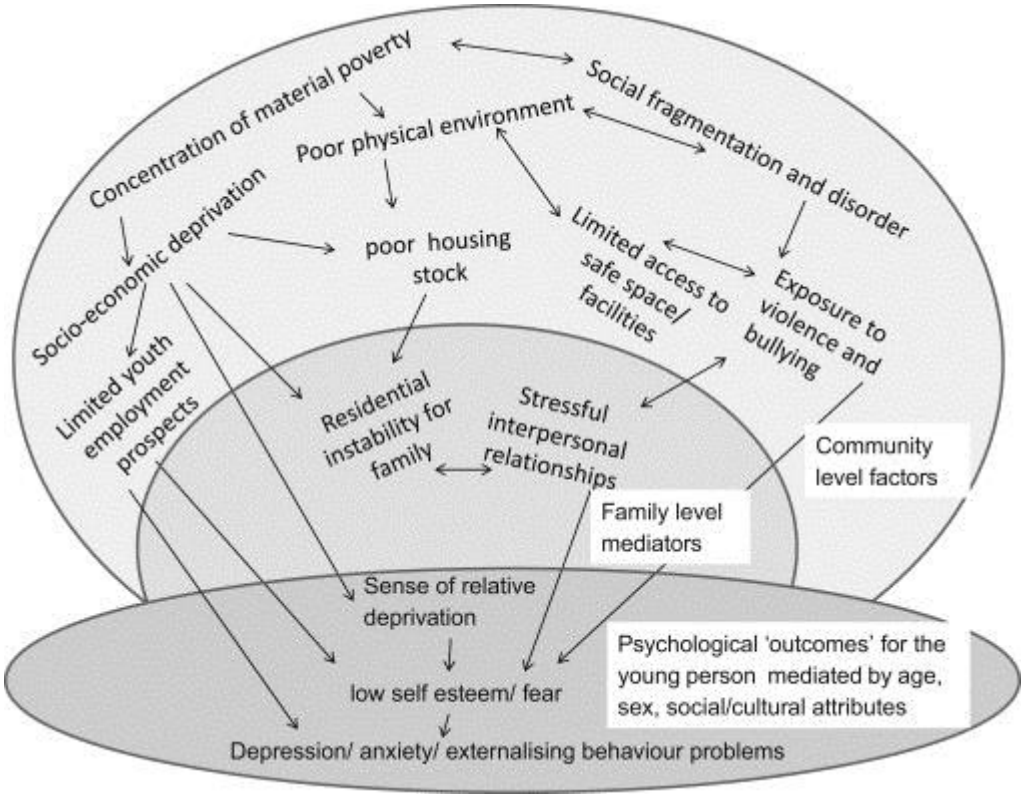


FIGURE 1. Schematic diagram of factors at the levels of the community, family and individual young person that are considered in the conceptual framework of Curtis et al (2013). Arrows indicate some of the pathways through which causal processes may operate (Curtis et al 2013).

Worth noting, however, is that according to several researchers the peak age for the onset of most mental disorders is in fact not adolescence but young adulthood (years 19-34), which is a period of crucial importance for the establishment of emotional wellbeing in adult life (eg. Suvisaari et al 2009, Kosidou et al 2012). This is because it is involving separation from childhood family, identity formation, major decisions about education and career, and often also parenthood (Suvisaari et al 2009). One may note, too, that all these processes are important processes, especially in later, adolescence, too. Modern visions of mental health do not see mental health as determined in early childhood but emphasize the lifelong experiences and environmental factors as risk factors and protective factors for mental disease.

1.4 The secular changes of mental health among adolescents

There is not agreement in scientific literature of secular changes in adolescent mental health and mental health in general. Rutter and Smith (1995), Prosser and McArdle (1996), Fombonne (1998) and Maughan et al (2005) have concluded that psychic disorders are increasing in Western societies on the basis of several different kind of data and evidence, but obviously all lacking exactitude of consistent systematic reviewing. Rutter and Smith (1995) did not find any clear explanation for increasing adolescent mental problems but discussed the following: 1) Firstly, the transition from dependence on parents to status as young adults has been constantly pushed to later age, 2) increasing affluence has given better prospects for most young people. Yet, expectations might have increased at an even more rapid pace, which in turn might lead to frustration and 3) both alcohol and illegal drugs are used more by young people. However, frustration as a mechanism may be oversimplified, and instead mental wellbeing might be a result of balance between contexts and individual differences because, according to Deci and Ryan (2000), social contexts and individual differences that support satisfaction of the basic needs facilitate natural growth processes including intrinsically motivated behavior and integration of extrinsic motivations, whereas those that forestall autonomy, competence, or relatedness are associated with poorer motivation, performance, and well-being (and increase frustrations) .

Perhaps the strongest scientific support for the vision of increasing mental problems among adolescents is Twenge et al (2010) publication, which found large, generational increases in psychopathology in American college students between 1938 and 2007 based on meta-analysing Minnesota Multiphasic Personality Inventory (MMPI) scores reported in scientific literature. The high proportion of students of psychology in the samples may bias these study results. This vision of negative change is often taken as given in publications concerning adolescent mental health, perhaps because it emphasizes the importance of the studies of adolescent mental health.

Two recent systematic reviews, Richter and Berger (2013) and Bor et al (2014), have reviewed evidence of secular changes in mental health during this millennium with sufficient detail also in adolescents for being relevant for this thesis. According to results of Bor et al (2014) concerning adolescents the burden of externalizing problems appears to be stable, but the

majority of studies report an increase in internalizing problems, such as depression and anxiety, in girls. The findings for internalizing problems in boys were mixed. According to Richter and Berger (2013) five studies did not find any change, but four studies found increase and one study found decline in adolescent mental problems. Earlier they had concluded (Richter et al 2008) that there is no sufficient evidence for increasing mental disorders in the recent decades. Perhaps much more interesting is their conclusion that the increasing demand in psychiatric services is not associated with increasing mental disorders in the general population. It can be considered if there is real congruence between mental health problems detected in population studies with questionnaires and diagnosed psychiatric disorders. Like eg. Richter and Berger (2013) say, the likely reasons for increased use of psychiatric services are changed attitudes. Busfield (2012) suggests as explanations for claims of increasing mental problems in the general population the following 1) first and most importantly, the major changes that have occurred in the official boundaries of mental disorder over the post-war period, which have also changed the ideas and perceptions of professionals and the public about mental health and illness; and 2) the ready way in which data on mental health and illness can be used to support criticism of certain features of present-day society. She also says (Busfield 2012) while remembering that data from studies using instruments like the GHQ do not measure psychiatric morbidity as defined in official classifications, it is clear that there is no consistent picture of a long-term decline in general mental wellbeing. Here we again meet the vague nature of concepts in social psychiatry: mental wellbeing and psychiatric morbidity could also probably be seen as distinct dimensions of mental health. Baxter et al (2014) regard as the most likely explanation for the perceived “epidemic” of mental diseases increasing numbers of affected patients driven by increasing population sizes. As possible additional factors they see 1) higher rates of psychological distress measured using symptom check lists and 2) greater public awareness and the use of terms like depression and anxiety in contexts where they do not represent clinical disorders, which may be seen to be the case in population questionnaire studies, too. Like mentioned above there is no correlation with psychiatric service use according to Richter and Berger (2013). Bushfield (2012) and Baxter et al (2014) publications are general social psychiatric articles and not specific for adolescents. However, I would add here one possible explanation more for concerns of adolescent mental health: claims of increased mental problems among adolescents may have been influenced by general claims of increased mental problems in populations.

Changes in economic conditions, new technology and investments in health services and education are all factors, which may have brought up negative or positive effects on adolescent mental health. Rutter and Smith (1995)s` ideas according to Lager and Bremberg (2009) were presented earlier. Maughan et al (2005) have reviewed some presented suggestions for reported time trends in a selected overview of adolescent mental health. Among others there may have been changes in diagnosis (autism spectrum disorders and eating disorders), expanded access to treatment (ADHD), changes in drug markets, accession to guns and abortion legalization (conduct problems and delinquency), increased prevalence of drug and alcohol use (suicide), school stress (deliberate self-harm), academic pressures (emotional problems) and media interest (eating disorders).

Lager and Bremberg (2009) have reported correlation between national secular changes in the proportion of young people not in the labour force (15-24 year old) and the national secular changes in proportion of young people (15 year old) with mental health symptoms (0,77 for boys and 0,92 for girls). If confirmed in the future this would indicate the changes in the structure of national labour market situation as an important contributing factor to national adolescent mental health for young people (Lager and Bremberg 2009). Changes in gene frequencies are not a major explanation of changes of mental health in populations although they can`t be completely excluded, too, under conditions of strong international migration, because according to eg. Way and Lieberman (2010) it looks like being possible to explain intercultural differences in social sensitivity with differences in gene frequencies. An open question here is how daily interaction with peers at school and leisure time could contribute to mental health.

Scientific publications have also reported results according to which mental problems have diminished and adolescents` mental health improved while others have reported trends in both directions (reviewed later). Reasons for positive changes could be increased wealth, investments in mental health promotion and treatment, or increasing social networking, among others.

1.5 The type of needed information

There is not clear picture of how generalizable research results are over cultures even between developed western countries. Information looks being very scarce of social factors influencing on adolescent mental health in the population level and how these influences are intermediated to changes in mental health. Like generally known, the determinants of health are only imperfectly understood in this moment, but adolescent mental health should be understood in the perspective of the whole life development of the individual in order to be able to understand all consequences of variation in mental health in the adolescent population.

1.6 Reasons for need of information of adolescent mental health.

There are many important reasons to study adolescent mental health. Adolescent mental problems are very common, and they are a burden not only for the adolescent himself and his family but for the social and health services and the judiciary. For young people, neuropsychiatric disorders are the leading cause of health-related burden, accounting for 15–30% of the disability-adjusted life-years (DALYs) lost during the first three decades of life (Kieling et al 2011)[2] They also influence on psychic development and socioeconomic position during whole life. Like earlier mentioned, on the basis of neurobiological studies, it is often supposed, that alcohol, cigarette and drug use are especially harmful in adolescence, because important reorganizations like diminution of grey matter and intensification of synaptic connections by selection and pruning occur (eg. Jacobsen et al 2005, Bossong and Niesink 2010, Guerri and Pascual 2010). Because there are changes with time in the prevalence of drug use in adolescence, there is a danger of negative changes in mental morbidity for this, too.

According to Tick et al (2008) information about secular trends in adolescents' emotional and behavioral problems can inform us if there is empirical ground for concerns about their wellbeing in a changing society. Several published reports have concluded that rates of psychosocial mental disorders have been increasing (Fombonne 1998, Costello 2006). Such

information is of importance for estimating service needs in the population and, subsequently, to develop an effective health service policy. A motivation to use repeated cross-sectional, epidemiologic studies is the limited information base of the official registers (Sourander et al 2008), because only a portion of mental disorders become diagnosed and registered via service utilization. A part of the scientific publications have also reported results according to which mental problems have diminished and adolescents` mental health improved while others have reported trends in both directions. That`s why research with more advanced methods and new ontological insights are needed in order to know instead of only supposing.

Cross-sectional repeat studies are regarded as important because they widen the knowledge base by adding the dimension of time. Registries are giving information only of the use of services and formal diagnoses (Sourander etal 2008). Repeated cross sectional studies are, like single cross-sectional studies, complementing this information of registries with population level information, but they may also capture influence of societal changes on mental health in a society.

Cohort studies also are a very important type of study, because they provide information of developmental trajectories, which may explain changes and outcomes of adolescent mental health, but not discussed more here. An important example of this kind is the Christchurch Health and Development Study, a longitudinal study of a birth cohort of 1265 individuals born in Christchurch, New Zealand in 1977 and followed up to now to over age 30 (eg. Gibb et al 2012).

1.7 Systematic review as a method of research

According to Korhonen et al (2013) the aim of a systematic review is to identify, critically evaluate and synthesize the results of all high quality studies published on a given subject, so that research evidence that has been assessed as reliable is available in a usable form. In evidence-based practice, systematic reviews are particularly valuable because they present the best evidence in

systematic form. Best evidence usually refers to randomized controlled trials and their systematic reviews using meta-analysis. In meta-analysis, the results of homogenous studies are combined using statistical methods. The result thus combined describes the effect of the intervention investigated. While the statistical procedures used in a meta-analysis can be applied to any set of data (Borenstein et al 2009), the synthesis will be meaningful only if the studies have been collected systematically, which could be in the context of a systematic review. While traditional or "narrative " reviews are often seen as lower in quality among advocates of systematic reviews, traditional reviews often address (Hammersley 2005) large and complex areas involving multiple issues -frequently being designed to provide a map of research in the relevant field.

Rationale of this approach of systematic review is grounded firmly on several premises which are presented below as truncated from Mulrow (1994): Firstly, large amounts of information must be reduced into palatable pieces of digestion. Through critical exploration, evaluation, and synthesis the systematic review separates the insignificant, unsound, or redundant deadwood in the medical literature from the salient and critical studies that are worthy of reflection (Morgan 1986). Secondly, various decision makers need to integrate the critical pieces of available biomedical information. Systematic reviews are used by more specialized integrators, for example economic and decision analysts, to estimate the variables and outcomes that are included in their evaluations. Integrations are used by clinicians to keep abreast of the primary literature in a given field as well as to remain literate in broader aspects of medicine (Garfield 1987, Lederberg 1986). Researchers use the review to identify, justify, and refine hypotheses; recognize and avoid pitfalls of previous work; estimate sample sizes; and delineate important ancillary or adverse effects and covariates that warrant consideration in future studies. Finally, health policy makers use systematic reviews to formulate guidelines and legislation. Thirdly, the systematic review is an efficient scientific technique. Although sometimes arduous and time consuming, a review is usually quicker and less costly than embarking a new study. Review can prevent meandering down an already explored path. Fourthly, the generalizability of scientific findings can be established in systematic reviews. The diversity of multiple reviewed studies provides an interpretative context not available in any one study (Light et al 1984), because there are often remarkable methodological differences between studies. Probably in preparing an experiment one should familiarize with published experimental studies and pay attention to their

methodological details, too. Closely related to generalizability, a fifth reason for systematic reviews is to assess the consistency of relationships. A sixth reason for systematic reviews is to explain data inconsistencies and conflicts in data. Seventhly, an often cited advantage of quantitative systematic reviews in particular is increased power. Eighthly, quantitative systematic reviews allow increased precision in estimates of risk or effect size. A final rationale for systematic reviews is accuracy, or at least an improved reflection of reality. Systematic reviews and meta-analyses apply explicit scientific principles aimed at reducing random and systematic errors of bias. At the very least, the use of explicit methods allows assessment of what was done and thus increases the ability to replicate results or understanding of why results or conclusions of some reviews differ. In addition reviewers using traditional methods are less likely to detect small but significant effects than are reviewers using formal systematic and statistical techniques. Traditional review recommendations lag behind and sometimes very significantly from continuously updated or cumulative meta-analyses,too.

Meta-analysis and calculation of a summary statistic are not always possible in systematic reviews because of the diversity of the studies included. Especially, according to Egger et al (2008), although systematic reviews and meta-analysis of observational studies are as common as randomized controlled studies, confounding and selection bias often disturb the findings. In addition bigger is not necessarily better: smaller studies can devote more attention to characterizing confounding factors than larger studies. For example different response rates in cases and controls in case-control studies are a common source of bias because socioeconomic status groups often deviate in response rates. There is a danger that meta-analyses of observational data produce very precise but spurious results. The statistical combination of data should therefore not be a prominent component of systematic reviews of observational studies. More is gained by carefully examining possible sources of heterogeneity between the results from observational studies. Individual participant data is often needed for this purpose.

Well planned literature search protocol is central in systematic reviews. Still, according to Greenhalgh and Peacock (2005), in systematic reviews of complex and heterogeneous evidence, such as taken for management and policy-making questions, formal protocol-driven search strategies may fail to identify important evidence. Informal approaches like

browsing, asking around and being alert to serendipitous discovery can substantially increase the yield and efficiency of search efforts. “Snowball” methods such as pursuing references of references and electronic citation tracking are especially powerful for identifying high quality sources in obscure locations. Moher et al (2009) noted that only few authors of systematic reviews report assessing possible publication bias.

Reviews that go beyond questions of effectiveness are newer, utilize a more diverse range of methods than their more established ‘what works ‘ counterparts and often concentrate on synthesizing the textual findings from ‘qualitative studies’ (Harden and Thomas 2005). In the methodology of systematic reviewing the role of qualitative research is an important issue. For example a method of synthesis of qualitative studies known as meta-aggregation, which allows a synthesis of qualitative studies in a reliable manner, has been developed at Joanna Briggs Institute (Korhonen et al 2012). According to Dixon-Woods et al (2001) some forms of qualitative data can be transformed into quantitative data and then subjected to quantitative analysis, but such approaches are not what is usually meant by qualitative research. Qualitative research has an especially valuable role to play in answering questions that are not easily addressed exclusively by experimental methods. Full-scale exploitation of qualitative evidence will only occur when all available qualitative evidence is brought more directly into conjunction with the synthesis of other evidence in systematic reviews. In principle, using methods from Bayesian statistics, it would be possible to synthesize both the qualitative and quantitative data. There are several possible roles for qualitative evidence in systematic reviews according to Dixon-Woods et al (2001). With it the question of the review can be identified and refined. Also the relevant outcomes of interest, relevant types of participants and interventions can be identified. Data to be included in a quantitative synthesis can be augmented and provided for non-numerical synthesis of research. It is possible to highlight inadequacies in the methods used in the quantitative studies and explain the findings in them. Finally, quantitative research assists in the interpretation of the significance and applicability of the review and assists in making recommendations to practitioners and planners about implementing the conclusions of the review.

As far as I can see the first three roles are especially fundamental in order to reduce the risk of discarding interventions, which could be applicable in narrow band contexts. As statisticians frequently emphasize (Hammersley 2001), “decisions about *which* test to use cannot

be governed by rules: what is required is judgment that takes into account the purposes of the inquiry, the nature of the data available, and the character of the psychological or social processes that are being studied. Much the same is true of most other aspects of doing social research: judgment is involved, it cannot be eradicated; and attempting to eradicate it is unlikely to serve the task of research well". This is obviously true for medical and health research, too.

According to Hammersley (2001)`s educational research article how much evidence is required, and what kinds, varies according to the nature of knowledge claim made, both in terms of its type (descriptive, explanatory or theoretical) and its own degree of plausibility and credibility. Using fixed, standard criteria specifying a hierarchy of research designs ignores these sources of variation. It neglects the extent to which assessing the validity of studies` findings is a matter of contextually-sensitive judgment. He (Hammersley 2001) also notes the assumption in systematic reviews is that studies can be assessed in purely procedural terms, rather than on the basis of judgments which necessarily rely on broader, and often tacit, knowledge of a whole range of methodological and substantive matters. This is no more than an assumption, and not one that is very plausible in the light of criticisms of the positivist model presented in his article. I think this criticism is not especially practical for randomized controlled trials with sound natural scientific basic methodological background but should be considered in observational studies and behavioral interview and questionnaire studies like included in this systematic review.

A theoretical advancement has been mixing of methods at the review level; combining the findings of multiple, already existing, studies that are labelled broadly as using either 'qualitative' or 'quantitative' methods (Harden and Thomas 2005), but using two or three different methods that are weaker than other at answering a particular type of question does not give a more reliable and valid answer. Much research in the real world does not fit into neat categorizations of 'qualitative' and 'quantitative' and also does not appear to be too concerned with the epistemological issues that so exercise some commentators (Harden and Thomas 2005). Harden and Thomas (2005) see clearly defined epistemological and ontological foundations as a prerequisite for eg. educational research although neglected in some methodological texts, but the need for this is also striking for research in mental health issues owing to the broad socially interactive nature of concepts.

It may be that the term systematic review should be limited to reviews of randomized controlled trials with clearly defined outcomes for reducing confusion and debatable results. The systematic reviews of observational studies and other designs may be more properly classified together with narrative or traditional reviews. It may be systematic reviews of randomized controlled studies are the only ethical enough source of information for decisions concerning how to deal human diseases in general, although treatment decisions in real life often have to be done on the basis of more imperfect information –even on the basis of general practice information without scientific research information because of a lack of this kind of information. In addition, randomized controlled studies are not possible for resolving all kind of scientific problems especially in health sciences and medicine. Perhaps the utilization of systematic reviewing methodology of research literature would be a good idea in the beginning stage of all research projects.

1.8 The measures of mental health relevant for this review

Problems of mental health are measured with questionnaires and psychiatric interviews enabling diagnosis. Diagnostic interviews are rare in population studies because of high costs and difficulties in arrangements. Questionnaires usually utilize point series, which measure different areas of mental health in general or are based on diagnostic criteria used in a diagnostic classification system. Informants in the studies of adolescent mental health are usually the youth them shelves, their parents or their teachers. A short review of measures used in the reviews included in this systematic review follows.

According to Goodman and Scott (1999) the Strengths and Difficulties Questionnaire (SDQ) is a short questionnaire of behavior, which can be filled by child`s parents, his (her) teachers or the child himself. The test has been translated to thirty languages. According to validations it may function as well as Rutter tests (Goodman 1997) and it is better than CBCL.

Child behavior Check List (CBCL), which is longer than SDQ questionnaire (Goodman and Scott 1999), has the same properties as SDQ, and CBCL and SDQ correlate strongly with their each others. CBCL has 118 points of only psychopathology. The Teacher Report Form (TRF) is a questionnaire of 4 pages, which has been planned to be filled by teachers or teacher aidees (Edelbrock and Achenbach 1984). Hartman et al (1999) have questioned the structural validity of both CBCL and TRF, for they got insufficient support for cross-informant syndromes and their separateness. Macmann et al (1993) have criticized the high correlations of items on more than one narrow band scales in both TRF and CBCL.

Rutter questionnaires are respected screening questionnaires of behavior (Goodman 1997). According to Goodman (1997), although Rutter-questionnaires are fundamentally shorter than CBCL questionnaires, The Rutter version for parents does not look being less useful than CBCL. According to Goodman`s validation study, SDQ-questionnaire is as good as Rutter questionnaires, but has additional merits, too. The General Health Questionnaire (GHQ) was built as a 60-point screening instrument (Tait et al 2003). It has been translated to several languages (Tait et al 2003) and cross-validated for adults as a part of WHO mental health project (Goldberg et al 1997). The appreciation was that the shortened 12-point GHQ functioned well and its sensitivity was 83,4% and specificity 76,3%. French and Tait (2003) suggested in their validation study that adolescents interpret GHQ-12 in the same way as adults.

According to Hagquist (2008) and Hagquist and Andrich (2004) WHO-study Health-Related Behavior in School Children (HBSC) is formed of eight questions, which measure somatic and psychological problems. A central recognized problem in HBSC-questionnaire is, how points should be rated and categorized, because they have been formulated of both quantitative and qualitative response categories. According to Haugland and Wold (2001) HBSC has good content validity, but Hagquist and Andrich (2004) disagree on the basis of their Rasch-analysis.

The Psychosomatic Problem Scale (PSP) consists of only qualitative response categories (Hagquist 2008). It has also been formed of eight points, which have been formulated to retrieve information of children`s and adolescents` psychosomatic health problems in the population. According to Hagquist (2008) psychometric validation analysis shows that PSP-scale can be used to monitor adolescents` psychosomatic problems and for repeat surveys in the

population level. KIDSCREEN-10 is a shortened version of KIDSCREEN-52 and KIDSCREEN-27 questionnaires, which are used to measure children`s and adolescents` quality of life in respect to health (Ravens-Sieberer et al 2010). According to Ravens-Sieberer et al (2010) it is measuring well general quality of life, but does not reach well most single dimensions of the original KIDSCREEN-52-measure. This is not a problem in this review, because interest is in adolescent mental health in general.

According to Timbremont and Braet (2004) Children`s depression Inventory is used for 7-17 year old children and adolescents, and it consists of 27 points, which measure cognitive, affective and behavioral symptoms of depression. The original questionnaire has a remarkably high internal consistence, test-repeat test reliability and predictive, convergent and structural validity especially in non-clinical populations. In the study included in this review CDI is used in combination with Rutter.

According to Raitasalo (2007) the Finnish form of the Beck depression inventory (R-BDI) has good internal validity (Cronbach`s alpha 0,83-0,88 depending on study and gender) , although it is not specific for adolescents. Social Phobia Inventory (SPIN) has also been primarily used with healthy adult volunteers and psychiatric patient, but according to Ranta et al (2007) it has good validity in adolescents (test–retest reliability r=0.81, and internal consistency alpha=0.89). They found support both for one factor and three factor structure.

Youth self-report (YSR) is a self-report measure of general psychopathology for children between 11 and 18 years age (Adams et al 1997). The questionnaire contains 12 items that yield two broadband factors (internalizing, externalizing) and eight narrowband factors According to Adams et al (1997) its validity has been shown by Achenbach and Edelbrock (1991).

As far as SCL and IDA are concerned I have not information of validation studies for them. The measures are summarized in TABLE 1, however SCL and IDA are not included, because no validation studies for them were found.

TABLE 1.

A summary of validated mental health measures used in the studies examined in this review

Measure and references	**Content**	**Who fills ?**	**Outcome**	**Validation for adolescents**	**Critic for validity**
SDQ *Goodman 1997*	Strengths and difficulties	Child`s parents, his(her) teachers, a self-report version for 11-16 year olds	A Total difficulties score	*Goodman 1997*	
CBCL *Goodman and Scott 1999, Biederman et al 1995*	Child behavior check list	Child`s parents	A total difficulties score	*Goodman and Scott 1999*	*Hartman et al 1999. Macmann and Barnett 1993*
TRF *Edelbrock and Achenbach 1984*	Teacher report form	Child`s teachers or teacher aidees	Several scores measuring behavior problems	*Edelbrock and Achenbach 1984*	*Hartman et al 1999, Macmann and Barnett 1993*
Rutter *Goodman 1997*	A behavioral problem screening instrument	Child`s parents, his (her) teachers, aversion for adolescents	A total score	*Goodman 1997*	
GHQ *Tait et al 2003*	A general psychic health questionnaire	Adolescents	A total score, which measures state rather than trait	*French and Tait 2004*	
HBSC *Hagquist 2008, Hagquist and Andrich 2004*	Health related behavior in school children, somatic and psychic.	Students at school	The question of rating has not been settled.	*Haugland and Wold 2001*	*Hagquist and Andrich 2004*
PSP *Hagquist 2008*	Psychosomatic problem scale	Students at school	The scale is formed by summation of responses over all items	*Hagquist 2008*	
KIDSCREEN 10 *Ravens-Sieberer et al 2010*	Quality of life in relation to health	Adolescents and children, their parents	An overall score, which measures well general quality of life	*Ravens-Sieberer et al 2010*	
CDI *Timbremont and Braet 2004, Craighead et al 1998*	Children`s depression inventory	Children and adolescents	A total depression score	*Craighead et al 1998*	
YSR *Adams et al 1997*	Youth self report questionnaire	Adolescents	Two wide band and eight narrow band factors	*Adams et al 1997*	

R-BDI *Raitasalo (2007)*	Depression inventory	Adolescents	A total depression score	*Raitasalo (2007)*	
SPIN *Ranta et al (2007)*	Social phobia inventory	Adolescents	A total social phobia score	*Ranta et al (2007)*	

2. THE AIM AND OVERVIEW IN THE CONTENT OF THIS STUDY

In this study I want to find out if there have been changes in the prevalence of adolescent mental problems during the last 10 years. The age group is 12-22 years. The method I use is a systematic review of publications with repeated cross sectional population studies with at least two time points separated with years of their each others. The publications included in the study have been collected with a systematic literature search with the help of an information specialist of the library.

In the following report I group these studies, fairly few in number, which have used comparable measures in two or more time points, according to the direction of the trends detected. That is whether the adolescent mental health has improved, declined or there are trends in both directions. Regionally these studies are restricted to countries of Western Europe and Northern America. Defined like this, these are the countries, where the influence of the Weberian protestant ethics has been the strongest. Australia and New Zealand are not included while no repeated cross sectional studies of adolescent mental health conducted there.

The influence of the Protestant ethic in relation to the development of capitalism and western societies has been widely discussed (Merrens and Garrett 1975) and it has been also conceptualized as a personality variable (Mirels and Garrett 1971). Several scientific publications utilizing the protestant ethic scale report significant correlations in several dimensions like attitudes to poor, comfortable life, ambition, self-control and social responsibility (Mirels and Garrett 1971), which may be expected to both modify answers in mental health questionnaires

and influence on expressions of dimensions of mental health. That`s why I regard it as sensible to control this world historical variable as much as possible in this review. Research suggests that religion is generally a protective factor for mental illness (Levin 2010). It is true also that Protestantism is nowadays a minority in Central Europe because unreligious people and Roman Catholics are nowadays the other prevailing religion groups. Belgium and France are omitted because they are mainly Catholic in religion.

Special attention is paid to whether the study is based on the national samples, more regional samples or both. The other way to explore epidemiological time trends in mental health are meta-analysis of cross sectional studies. This kind of study has been made by Costello et al (2006) and concluded that there is no evidence of increasing mental problems among adolescents during the preceding 30 years. The problem of meta-analysis is, however, the comparability of results obtained by different measures.

A decision had to be done if two studies of common mental disorders –consisting of only anxiety or depressive symptoms- should be included. Von Soest et al`s publications (2012 and 2014) were included because their descriptions of depressive symptoms look quite general complaints and they see them epidemiologically comparable even with externalizing symptoms described in other international articles (with Maughan et al 2008). On the other hand, like earlier mentioned, according to Klein et al (2011) there is substantial comorbidity between depression and other forms of psychopathology. The other unclear article was Kosidou et al`s (2009) publication of anxiety, mental health service use and suicidal behavior in Stockholm. This publication was omitted, because there look being consider confusion of anxiety prevalence in literature. According to Meertens (2004) depression symptoms are the most prevalent type of mental disorder, about 20%, in Europe, but according to Kosidou et al (2009) prevalence of self-reported anxiety among young women was 37,7%. I think a discrepancy as big as this indicates confusion in how anxiety prevalence should be measured. It is questionable (Meertens 2004) whether depressive symptoms and anxiety symptoms are distinguishable disorders. Some researchers even hold the view that anxiety is a core phenomenon that underlies all kinds of disorders (Meertens 2004).

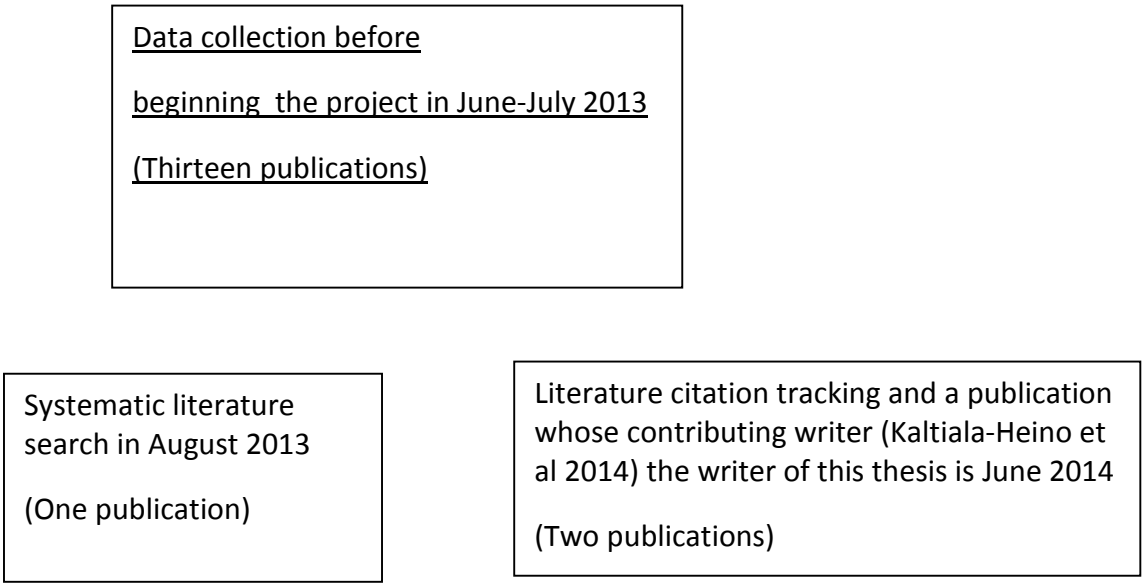
3. METHODS

The chart of the literature collection process is shown in FIGURE 2. The adolescent age group of interest in this study was decided to be 12-22 years. Before the decision of the writing of this review and thesis had been done, a bulk collection of repeated cross sectional studies had already been collected by the author in June 2013 by utilizing search engines like Google Scholar, Google and PubMed. These references were also manually searched for additional citations. This search caught studies in English, German, Swedish and Norwegian languages.

The following databases were searched by me and the information specialist of the library: Scopus (up to 6.8 2013), PsycInfo (up to 6.8. 2013) and Ovid (up to 7.8.2013, several exploratory , supplementary searches with variable dates of coverage). According to PRISMA statement for reporting systematic reviews search path for at least one database should be described in detail (Liberati et al 2013). As a total these two searches produced 138 articles. The searches in OVID were more exploratory in character. A protocol of it is given in FIGURE 4.

Figure 2

Summarizing chart of the phases of the literature collection process.



Total number of publications: 16.

The inclusion criteria: At least 2 samples with the same measures years of their each others, age group 12-22, expert background of the publication and mental health/ mental problems in a broad sense.

The exclusion criteria: Study of a specific disorder and only one sample or period <5 years.

The number of the publications refers to the TABLE 2. Number of publications is the number of publications included in the final analysis (earlier publications with repeating information mentioned only in the main text).

FIGURE 3. Literature search protocols in Scopus and PsycInfo.

3a. The literature search command in Scopus (*with supplementary explanations in italics*):

((TITLE-ABS-KEY("mental health" OR "mental health disorders") [=*where ever in the search field*] AND TITLE-ABS-KEY (adolescent*) AND TITLE(trends) OR
AND TITLE(adolescent* OR young* OR teen*) AND TITLE-ABS-KEY(trends) [=*two searches united so that the term trends or adolescent or its synonyms must be found in the title and one of them must be found in the reference, too*]AND TITLE-ABS-KEY(epidemiolog* OR "follow up" OR longitudinal OR "cross-sectional"))) [=*one of these study types*].

3b. The search command in PsycInfo (*with supplementary explanations in italics*):

"mental health" OR "mental disorders" OR "depression" OR "depressive disorder" OR "anxiety" OR "eating disorders" *[= index terms, Major Subject Headings*]
AND
ti(adolescent OR teen* OR young) *[= one of these is in the rubric*]
AND ti(epidemiolog* OR "time period" OR trend*) [=*one of the is in the rubric*]

FIGURE 4. Literature search protocol in OVID.

Ovid Technologies, Inc. Email Service

Search for: limit 28 to yr="2005 -Current"

Results: 3

Database: Ovid MEDLINE(R) Daily Update <August 07, 2013>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1946 to Present>
Search Strategy:
---

1 Mental Health/ (21353)
2 exp *Mental Disorders/ep, hi, px, sn [Epidemiology, History, Psychology, Statistics & Numerical Data] (161372)
3 1 or 2 (180771)

4 Cross-Sectional Studies/ (175666)
5 Finland/ep [Epidemiology] (8611)
6 sweden/ep (14428)
7 norway/ep (7121)
8 denmark/ep (9740)
9 limit 3 to "adolescent (13 to 18 years)" (50584)
10 4 and 9 (6627)
11 germany/ep (14314)
12 netherlands/ep (11617)
13 great britain/ep (19705)
14 United States/ep [Epidemiology] (82729)
15 australia/ep (11736)
16 New Zealand/ep [Epidemiology] (5288)
17 canada/ep (10237)
18 5 and 10 (51)
19 6 and 10 (59)
20 7 and 10 (53)
21 8 and 10 (46)
22 10 and 11 (118)
23 10 and 12 (65)
24 10 and 13 (67)
25 10 and 14 (521)
26 10 and 15 (86)
27 10 and 16 (63)
28 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 (1108)
29 limit 28 to yr="2000 -Current" (678)
30 limit 28 to yr="2005 -Current" (501)

Because one of the aims of this review is to discuss the quality of published scientific information, the only quality criterion for selection was the expert background of the journal and this was deduced on the basis of the name of the journal. Only Hagquist`s (2011) ,Ravens-Sieberer et al`s (2012) and Kaltiala-Heino et al`s (2014) publications were not in peer reviewed, international journals. This extensive approach was made possible by the small number of publications available allowing scrutinizing the relevance of all available publications. The methodological requirement was that more than one cross sectional evaluation had been done with comparable methods and mental health in broad sense was mapped.

The lists of references were read through and the titles indicating possible relevance for this review were retrieved. If there was suspicion after the title search that a reference may be relevant for the review, its abstract was checked. One new relevant publication (Hagquist 2009) was found. Citation tracking was done in June 2014 and a recent publication in which I was a co-

author (Kaltiala-Heino et al 2014) was added to the collection. These measures added two new publications. After these procedures, publications in English, German, Swedish, Norwegian and Finnish were with in the final collection of publications (TABLE 3).

Because it is not quite obvious whether mental health varies temporally, also publications published before the last 10 years are included for trying to critically estimate if this kind of changes ever happen. The reviewed publications are listed in TABLE 3. Earlier publications of the same research groups, which repeat the same information, are not included in the table but they are mentioned in the main text. The quality scores of these publications were estimated with the 8-point checklist developed by Loney et al (1998), which is presented in TABLE 2.

TABLE 2.

Methodological scoring system used to rate studies reviewed (according to Loney et al 1998).

Number of item	**Item**	**Score (points)**
1	Random sample or whole population	1
2	Unbiased sampling frame (i.e.census data)	1
3	Adequate sample size (in this thesis>239 subjects)	1
4	Measures were the standard	1
5	Outcomes measure by unbiased assessors	1
6	Adequate response rate (70%), refusers described	1
7	Confidence intervals, subgroup analysis	1
8	Study subjects described	1

Maximum score 8 points.

Adequacy of the sample sizes was checked comparing with a calculator result in the OpenEpi website. For getting a point all samples must fulfill the criterium and there must be sufficient uniformity between them, too (this check list was also used by Bor et al (2014)). The total number of publications included (TABLE 3) is sixteen. The analysis process was somewhat cyclical like often in qualitative studies although the publication sample is totally quantitative.

4. RESULTS

4.1 Information of positive development in adolescent mental health

As a summary of the observed publications (TABLE 2) reporting positive development in adolescent mental health were , that they have all utilized wide, national samples with the exception of Kaltiala-Heino et al (2014) study of Tampere secondary school students. Scotland in Levin et al (2009) is a part of the UK, but it has a traditional history and an individual culture of its own. Nowadays it is also deciding of many of its affairs independently in the parliament of its own and according to media a referendum of independence has been decided for autumn 2014. The UK has after 1992 enjoyed of the most standing economic growth over the level in most of Western Europe until 2008 (CIA world fact book 2013), the rising welfare improvement may thus have influenced on adolescent mental health. Maughan et al (2008) results concerning the whole UK indicate in the same direction. Collishaw et al (2004) have reported opposite kind of results from years 1974-1999, the explanation for this might be the limitations for the welfare expenditures settled by the government during the last couple decades (CIA World Fact Book 2013). As far as the more specific trends are concerned, deliberate self-harm among the English youth had increased during this period contradicting with positive change in adolescent mental health (Hawton et al 2003, O`Loughlin and Sherwood 2005).

According to Achenbach et al (2003), Achenbach et al (2002) and Achenbach and Howell (1993, abstr.) the 1990`s has been a period of positive development in the adolescent

TABLE 3.

Past research examining time trends in adolescent mental health. In cases, where several publications present repeatedly the same information, only the latest, updated publication is included. Earlier publications are mentioned in the main text.

Author	Year	Country	Period	Age group(s) (years)	Sample size	Measures of mental health	Main findings	Quality score
Information of improving mental health								
Achenbach et al	2003	USA	1976-1999	16-17	670	CBCL(old)	1976-1989 increasing problems, but reversed 1989-1999	4
Levin et al	2009	Scotland	1994-2006	11,5-15,5?	4408 5226 4149 5610	HBSC	Subjective health is improving, but gender differences persist and socioeconomic differences are emerging in some measures.	5
Maughan et al	2008	UK	1999-2004	5-15	4244 2930	SDQ	The upward trends in adjustment problems noted since 1970s and 1980s may have plateaued, and possibly begun to be reversed.	5
Kaltiala-Heino et al	2014	Finland	2002-2013	(15)-16	1483 1292	R-BDI SPIN YSR	Improvement in most dimensions of mental health	4
Information of bidirectional development								
Tick et al	2008	The Netherlands	1993-2003	11-18	1095 810	YSR (ASEBA)	Evidence for some small trends in selfreported problems. For boys, some decreases were seen, regarding mostly behavioral problems,	6

							whereas, for girls, some increases were seen in emotional and behavioral problems.	
Hagquist	2011	Sweden	1988-2011	15-16		PSP	The selfreported mental health was much worse during 1990s than durin 1980s.The increasing trend has leveled off and going down.	3
von Soest	2014	Norway	1992-2010	16-17		Developed of SCL (Derogatis 1974)	Psychic symptoms increased both in girls and boys during 1992-2002, but stayed stabil or even decreased during 2002-2010. Depression symptoms look like increased 1992-2002. Boys` psychic health looks like having developed more negatively than girls`.	6
Information of declining mental health								
Hagquist	2009	Sweden	1988-2005	15-16	1358 1319 1246 1112 1217 1339	PSP	Only small if any changes in boys as regards psychosomatic health problems, while among girls there changes indicating an increase in psychosomatic problems.	4
Sweeting et al	2009	Scotland	1987-2006	15	493 2142 3044	GHQ	Marked increases in GHQ-12 “caseness” among females between 1987 and 1999 and among both females and males between 1999-2006.	6

Wångby et al	2005	Sweden	1970-1996	15 (only girls)	522 529 509 All girls!	IDA research program	In most domains adjustment problems were approximately as common in 1996 as in 1970: More girls reported problems with self esteem and antisocial problems in 2006. Especially in peer relations there was an increase in positive adjustment.	4
Sigfusdottir et al	2008	Iceland	1997-2006	14-15	3913 6346 3556 7430	Derogatis et al 1971 questionnaire	Levels of anxiety symptoms have risen, depression levels among girls have risen	5
Collishaw et al	2004	UK	1974-1999	15-16		Rutter, SDQ	Substantial increase in conduct problems, also evidence for emotional problems	5
Collishaw et al	2010	England	1986-2006	16-17	4524 719	Rutter A	Evidence for a substantial increase in emotional problems, especially in girls	7
No detected changes								
Ravens-Sieberer et al	2012	Germany	2006-2011	11, 13, 15	4749 3166	Kidscreen 10,SDQ	Not changes	6
Sourander et al	2012	Finland	1998-2008	13-14, 15-17	1458 1569	SDQ	Substantial stability in emotional and behavioral problems but a trend showing decreasing prosocial behavior among girls (converging with boys). Alcohol, drunkenness and cigarettes decreased.	7
Verhulst et al	1997	The Netherlands	1983-1993	4-16, 4-18	744 173	TRF, CBCL	Results did not provide evidence of a clear	5

							secular increase in malfunctioning of dutch children and adolescents.	

mental health in USA, but 1976-1989 has been time of negative development. The sample of the year 1976 had been, however, collected from only the states of Maryland and Virginia and the capital Washington (District of Colombia) in the eastern coast of USA. According to the USA Bureau of Economic Analysis (2013) Maryland belonged then to the richest quintile (like capital Washington) on the basis of per capita incomes and Virginia belonged to the second highest quintile. In 2007 (Wednesday, August 29) in the Washington Post newspaper, N.C. Aizenman and Christopher Lee wrote Maryland is the wealthiest state in USA. Probably because of this regional bias the adolescent mental health is worse in later samples, which were collected from the whole area of continental USA (except Alaska). Achenbach et al (2003) also note this regional bias, but refer to some other study information for justifying the inclusion of the first time interval.

According to several experts socioecononomic differences are much more important as determinants of mental disorders than absolute differences, but this so called ”income inequality hypothesis” is still under fierce debate. For example Layte (2012) and Bechtel et al (2012) have completely opposed visions of the subject. Contradictionary with positive development of American adolescents` mental health is Ting et al (2012) information of their increasing visits in emergency units because of suicide trials and deliberate self-harm during years 1993-2008.

According to McCall (1991) this positive trend has persisted all the time after the second world war among the white Americans, which is connected with declining suicide mortality among the aged. He regards family dissolution and the poverty of white children as a reason for the increase in adolescent suicide mortality and increasing wealth as the reason for declining suicidality in the aged. A surprising McCall`s observation is the positive correlation between teachers` salaries and adolescent suicides. Perhaps the explanation is teachers` increasing alienation of the poorest pupils` circumstances. Instead there is more positive information of adolescent alcohol use (Faden 2006): The adolescents` normative age for beginning alcohol use has risen during years 1991-1998. There is not information based on repeated cross sectional studies in the 2000`s and it is not possible to make estimations on the basis of earlier studies, too.

According to Kaltiala-Heino et al (2014) fairly many positive changes in adolescent mental health have happened between years 2002-2003 and 2012-2013 among 15-16 years old secondary school students in Tampere in Finland, especially in boys. Both internalizing and externalizing symptoms have declined among boys, while use of drugs has declined in both boys and and girls. Tampere region belongs to regions of low unemployment and high educational level and GDP (Lindqvist 2010) and that`s why social conditions for positive development of adolescent mental health may be good in this region. According to media Tampere has been during years the most popular place to live in Finland in polls.

4.2 Information of bidirectional development in adolescent mental health

Tick et al (2008) has utilized partly more local samples for the publications, which report both positive and negative changes in adolescent mental health. Also the above analyzed American Achenbach et al (2003) publication utilized exactly in year 1976 a sample collected in two states and the capital region in the Atlantic coast, but in other years representative national samples. However, the Norwegian von Soest`s (2012, 2014) and the Swedish Hagquist`s (2011) studies , which both reported negative development in the 1990`s, utilized only or primarily national samples. They have also reported stabilizing or even positive development in the 2000`s.

According to Tick et al (2008) some small changes happened among Dutch adolescents during years 1993-2003: social problems, externalizing symptoms, aggressive behavior and breaking rules diminished among boys, while somatic troubles, internalizing problems, suicidal ideas and deliberate self-harm increased among girls. Drinking and drug use increased in both genders. The sample of the year 1993 was national while the sample of 2003 was from the province of Zuid-Holland (South Holland). Geographically Zuid-Holland is a part of the Dutch core area Randstad conurbation, which is only 25% of the area of the Netherlands, but produces 50% of the Dutch GDP (Van Oort et al 2010). On the basis of this, socioeconomic explanations are barely justified for the increase of mental problems in girls. In the case of Zuid-Holland, Yesilkagit and de

Vries (2002) argue, that the reforms in the direction of neoliberalism have produced negative results for the health care system. This may account for the declining girls` mental health. Decentralization has produced and stimulated laissez-faire culture in the lower steps of the administration (Yesilgakit and de Vries 2002). On the other hand, market centrism emphasizing individualism may have supported masculine models of behavior and diminished psychic symptoms in boys. This hypothesis is somewhat supported by Hagquist`s (2009) observation of Swedish boys, whose variance of psychosomatic symptoms increased during the recession, but not after the boom began, while girls` psychosomatic symptoms increased significantly, but only after the recession.

According to Hagquist`s (2011) Swedish publication self-reported mental health among Swedish adolescents was much worse in the 1990`s than in 1980`s. The increase of mental problems among 15-16 years old adolescents has stabilized and the development turned to positive direction in the 2000`s. These measurements have been made during years 1985-2011 with intervals of 3-4 years and partly as national HSBC-based analyses, partly as questionnaires surveying psychosomatic and psychic problems among pupils in the province of Värmland. This means these studies cannot be regarded to contain remarkable validity problems. A natural explanation for the declining adolescent mental health in the 1990`s would be the economic recession in the first years of 1990s owing to which unemployment was a serious problem in Sweden during the whole 1990s` (Bergmark and Palme 2003).

According to von Soest`s (2012, 2014) Norwegian publication several types of mental symptoms increased 1999-2002 in both genders, but stayed stabile or even declined 2002-2010. Depressive symptoms look have increased 1999-2002. It is worth noting in this point that depression looks being a general term here and in Norwegian culture when discussing psychic problems containing a wide spectrum of symptoms (see von Soest 2012). The development among boys looks being more negative than among girls. The report is utilizing a national sample among 16-17 year old school pupils. Perhaps the social culture in Norway is affirmative for the development of mental health in girls, a hypothesis which can be supported by the law of equal representation of both genders in the boards of big enterprises and the pursuit of the personnel

policy of the state of Norway to an equal representation of different population groups in filling jobs (source: the job advertisements of the public sector of Norway). There is some evidence that mental problems have declined in Norway and in Sweden in 2000`s.

4.3 Information of negative development in adolescent mental health

According to Sweeting et al (2009) and West and Sweeting (2003) there has been remarkable increase in mental problems measured among 15 year old girls during years 1987-2006 and among both 15 year old girls and 15 year old boys during years 1999-2006 in western Scotland in the conurbation area of Glasgow. The area of Glasgow has a fame as an area of health lower than average (eg Sweeting and West 2003, Reid 2008), although the variation of health is remarkable in different dimensions (eg. Sweeting and West 2003). According to Sweeting and West (2003) adolescent illness appears here most clearly as psychic suffering while chronic sickness and disability are here as frequent as elsewhere in UK. The lower level of somatic health than desired among the population may have influence on adolescent mental health in different ways. Collishaw et al (2004) have reported of the development of same kind in the whole area of UK during years 1974-1999 in the area of behavioral disorders and emotional problems, but the results were in conflict in relation to hyperactivity. In 2010 they (Collishaw et al 2010) reported very much same kind of results in the comparison of two national cohorts: Girls` emotional problems and boys` parent reported problems (but opposite to this youth reported problems) were more common in 2006 than in 1986 among 16 year old adolescents. However, there was no evidence of development differentiated according to socioeconomic factors.

According to Hawton et al (2003) adolescent violence and deliberate self-harm among girls increased in the area of Oxford in 1990-2000. According to O`Loughlin and Sherwood (2005) deliberate self-harm increased also among boys in the little town of Kidderminster in the northern part of the county of Worcester (of course, the relevance of samples from small locations

may be questioned in the context of this review). As a total publications made in UK of adolescent mental health are clearly conflicting (compare Levin et al 2009).

According to measurements made in Örebro, Sweden (Wångby et al 2005), teen age girls` adaptation problems were about equally common in 1996 and 1970, but in 1996 more girls reported of problems in self-esteem and antisocial behavior. In addition to this, in the area of antisocial behavior the problems were polarized (the problems were more common in lower social groups and diminished in higher social groups). A natural explanation for this is probably the economic crisis in the first years of 1990`s (Stefansson 2006), which influenced on employment significantly during all 1990`s. According to Stefansson (2006) the youth have been primary losers in the reduction of health services. However, according to Hagquist (2009) girls` psychosomatic troubles increased only little in Värmland during recession, but after it dramatically. Instead boys` psychosomatic troubles increased much during the recession, but remained stable after it. But because boys` variance increased too, there was not change in the level of averages during the recession. According to the earlier discussed Hagquist`s publication (Hagquist 2011) the mental health of Swedish adolescents would have begun to improve after 1990`s. According to Hagquist (2009) a governmental report has discussed three hypothetical reasons for the negative development of adolescent mental health: the developmental trend of labour markets to become more difficult, the increased insecurity of future caused by increased individualization and the bad action of the school system. According to Berntsson and Köhler (2001), psychosomatic symptoms have increased in all Nordic countries, but their definition of somatic symptoms is so clearly emphasized in the somatic side that it has not been included in the publications compared here. Probably it is not possible to make sure conclusions concerning the changes of adolescent mental health in Sweden. These results are also supporting the view that the strengthening of competitive social atmosphere could favour boys` mental health and the strengthening of collectivity girls` mental health. There is not usable information concerning the last 10 years.

According to Sigfusdottir et al (2008) anxiety symptoms have increased among 14-15 year old Icelandic school pupils in both boys and girls while depression symptoms have increased among girls in 1997-2006. According to CIA World Fact Book (2013) Iceland had reached before

2008 a strong economic growth, a low unemployment and a remarkably equal distribution of income. It may be that because of the small size of the population and other local factors in Iceland, eg. one third of the population is living in the capital Reykjakvik, Sigfusdottir et al (2008) publication should be classified as a local study. If the detected changes in mental health are really significant, perhaps their reasons should be looked for in the local news events.

4.4 Unaltered adolescent mental health

Ravens-Sieberer et al (2012), who studied German adolescents 2006-2010, Sourander et al (2012), who studied Finnish adolescents in the towns of Salo and Rovaniemi in 1998 and 2008 and Verhulst et al (1997), who studied Dutch adolescents in 1983 and 1993 (1993 sample in only the province of Zuid-Holland, the same as in Tick et al (2008) publication), did not find significant changes in adolescent mental health. According to more specific studies concerning these time intervals the alcohol use of the under aged in Finland has declined (Mäkelä et al 2012) and mobbing at school has diminished in Germany (Melzer et al 2012). According to Metso et al (2009) smoking has declined among 16 years old adolescents in Finland. One would expect these more specific positive trends to be visible as a better adolescent mental health level epidemiologically. However, according to Rainio et al (2009) positive trend in adolescent alcohol and tobacco use looks having turned to a negative direction during years 2007-2009. Self-reported depression has also almost doubled in Finland among socio-economically disadvantaged adolescents from 2000-2011 (Torikka et al 2011; their depression scale items look being quite distinct of feelings of normal life and that`s why this study, restricted to depression, is not included in this systematic review restricted in mental health in general in the population level). As far as the Dutch Verhulst et al (1997) study is concerned, because the economy of the wealthy Netherlands has grown up all the time during years 1983-2009 (CIA World Fact Book 2013), prerequisites for high level of health and welfare are there good. That`s why the level of adolescent mental health may also be in the highest attainable level for developed countries without possibilities to advance significantly.

This group of publications also looks lacking congruence between repeated cross sectional studies and studies of more specific trends. On the other hand the results support the result of the meta-analysis of Costello et al (2006) according to which there is no evidence of declining adolescent mental health during the previous 30 years.

5. DISCUSSION

5.1 Discussion of reliability and validity

Although the studies included in this systematic review have been evaluated for their quality with the scoring system of Loney et al (2010), the apparent simplicity of the scoring system does not exclude a possibility of subjective bias in scoring because of the variability of circumstances and research materials. That`s why it is probably best to be satisfied with the notion that all publications look being moderate in quality. My scoring agreed in 4 cases out of 6 with Bor et al (2014) scores, in 1 case the difference was 1 point and in 1 case 2 points. Probably at least two reviewers should have discussed the scores like also selecting the publications, but there was not resources available for this. It is generally recommended using experienced specialists (a minimum of two) in systematic reviewing. The highly social character of definitions in social psychiatry, as seen in the introduction, is emphasizing these points even more than usually. Here especially inclusion and omitting publications of depression and anxiety is especially open to critics. The study should be replicable with fairly identical results and in that sense its reliability should be good although the multitude of measures used in reviewed publications, culturally defined concepts and normativity of mental health means also incomparability of quantitative assessments. There is no evidence of low reliability of measures used in single studies.

There are not cause-effect relationships evaluated here and in that sense it is not sensible to discuss internal validity although I have suggested factors, which may explain results. However, it looks the correlation between population studies with questionnaires and psychiatric morbidity based on questionnaires is low, too (Richter and Berger 2013).

As far as external validity is concerned, the generalizability of the results also is clearly questionable. There are probably several possible, unknown causal factors, and their influences probably depend on unique historical circumstances within regions. Validity should be questioned because it looks there is not much correspondence between scores in the questionnaire studies and the use of psychiatric services (Richter and Berger 2013), too. Also it is problematic how the omission of studies of anxiety and the inclusion of studies of depression influence on the validity.

5.2 Discussion of results

At first it is worth noting that there is not data of late adolescence (18-22 years) at all. This review has concluded on the basis of repeated cross sectional studies that there is no clear evidence of changes in mental health during the last decades nor of whether such changes ever happen. Although the primary aim in this study was not to review trends of specific disorders, the situation looks there being the same. There is not any evidence of the influence of the measure used on the direction of change detected in the studies included in this review. The conclusion of non-existence of change in adolescent mental health has been made by Costello et al (2006) on their meta-analysis based on epidemiologic studies for adolescents born between 1965 and 1996. Oppositional kind of conclusions have been made by Fombonne (1998), Maughan et al (2005) and Prosser and McArdle (1996), who have concluded that psychic disorders are increasing in Western societies on the basis of several different kind of data and evidence, but obviously lacking exactitude of consistent meta-analysis.

An important point to note in this review data is that it is not possible to make quantitative comparisons between different studies. This is not only because of different measures of mental health used but also because of cultural differences. Worth emphasizing is they represent evaluations of qualified research groups well acquainted in social psychiatric analysis in their own country and culture. The only reasonable comparison to make is obviously the direction of change reported, because also the amounts of change are based on subjective judgments of respondents without an objective quantitative measure, which would give strict, objective quantitative intervals, too. When comparing directions of changes regionally clear differences look appear. The explanations given in the results part should be taken very cautiously. However, it looks possible that changes not only in health and social politics but also in economy and public policy in general may explain, at least partly, observed regional trends. These explanations are still very nuanced, because opposite directions may be explained with the same economic and social trends, for it is not empirically known what are eg. relative effects of privatization and declining expenditures in health care during economic booms and liberalization. In fact it may be that influences are opposite in comparisons between regions depending on complex cultural and social factors and their interactions. Clearly much research with validated methods would be needed.

An interesting observation was that when comparing trends between genders, it looks differences could be explained with socioeconomic factors. Although a conventional explanation for better trends of mental health in boys under economic boom and liberalization of markets would be superficially individualistic competition, a more realistic explanation may be the classical social domination of male groups – based on group identity- over females when new resources and possibilities appear, if the political system is not strong enough to secure fair and equal chances for all population groups.

According to Goodman et al (2007) though the comparability and combinability of studies depend on the equivalence of shared measures across studies, it is not unusual for researchers to make their own modifications to existing measures without checking if this changes psychometric properties. In their study apparently minor changes in wording led to systematic

differences in responses although the validity of the questionnaire may still be high. This questions, however, what is the comparability between original and different translations of questionnaires. Like generally known different languages are among the strongest differentiating factors between cultures and in many ways shape ways of constructing visions of reality. Although methods have been developed for the translation and cross-cultural validation of health status questionnaires (eg. Eremenco et al 2005), I think their practicality in the area of mental health is questionable because of the fundamentally interactive and social nature of concepts and definitions in mental health like stated in the introduction.

As far as reports of increased mental problems are concerned, they may also be because of changing attitudes among adolescents and their parents or increased attention paid on disruptive behavior. Eg. Mazumdar et al. (2012) have reported by utilizing GIS-geographical information systems that in California the incidence of mild autism correlates with the locations of the diagnostic facilities. This result indicates the diagnosis of autism for milder forms would be fairly clearly dependent on the definitions of the environment and local culture although according to them diagnostic practices and the financing are not explaining factors. GIS could obviously increase objectivity of research in this area by introducing objective spatial relationships to focus. Von Soest et al (2014) have compared the factor structures between their samples in the three time points of sample collection and shown that it is invariant between study samples and so increasing credibility of detected changes. They regard this as evidence of comparability between time points. However, I cannot see why the social acceptability could not have increased in relation to some symptom groups while stayed the same - or even reduced- in relation to other symptom groups.

It is possible that the large national studies reach the average situation of the country, although locations representing averages may be only few – or are lacking totally owing to the polarization phenomena. In few existing studies of differences between schools significant differences have been found in how much or little they promote positive health behavior; schools, which have the strongest ethos for committing pupils, also promote positive health behavior the most efficiently (West et al 2004). Schools have centuries been a central socialization instrument

for states for maintaining ideology and social order and that`s why cultural differences can well exert their effects on mental wellbeing also here.

Repeated cross sectional studies are not used to pay attention to economic situation or historical events and periods except with general references. A kind of exception is Lager and Bremberg`s (2009) publication, where dependencies between labor market trends and trends of adolescents` mental health were studied in 10 European countries in 1983-2005 on the basis of WHO HBSC questionnaire studies. Like noted in the introduction, according to them labor market trends may have influence on the declining adolescent mental health. Hagquist (2011) is discussing somewhat influences of the increased unemployment and the 11th September terror attacks on the mental health of the Swedish adolescents. In any case it is clear that youth mode phenomena have influence on adolescent health behavior. A distinct and troublesome example is “night dance”-culture in the beginning of 1990`s, which is connected with drug use (especially ecstasy) and has caused several deaths (eg. Weir 2000). It also is possible, that daily, profound use of soft drinks could cause aggressive behavior (Solnick and Hemingway 2012).

5.3 Discussion of alternative methods

A big challenge is the objective assessment of disorders in a continuously changing societal culture. In fact it could be questioned whether it is meaningful to utilize sophisticated statistical methods of analysis if we are not able to disentangle essential confounding factors because of the lack of our disability to even define exactly the basic concepts. Obviously this area of research would benefit much of exact, biological and psychological measures of mental disorders. In this moment MRI (magnetic resonance –methods for brain imaging) seems to be a method, which in the future may offer a distinct quantitative alternative to questionnaires and interviews in mapping mental disorders owing to its noninvasiveness and still apparently exact laboratory measurements of brain alterations. However, possibilities offered for this in this moment by MRI look being considerably exaggerated and it looks there are not breakthroughs visible in near

future. One reason for the over-optimistic evaluations of MRI-prospects may be the wide use of nuclear magnetic resonance also in the chemical study of the structure of complex biological macromolecules (NMR-methods, according to the basic physical phenomenon of nuclear magnetic resonance). However, this happens in completely different circumstances –with highly purified solutions in test tube circumstances, not in noninvasive laboratory facilities with living people like in brain research. Still more, it will not be easy to deduce, what is the significance of brain structure alterations for the development of personality in adolescence, because they are not present only in mental disorders like depression (Serra-Blasco et al 2013) and social anxiety (Syal et al 2012) but also in mediating short-term learning processes (Bueti et al 2012), in predicting results of tests of cognitive task performance (Mueller et al 2011) and even in differences of altruistic behavior (Morishima et al 2012).

Developmental changes detectable by MRI in the brain look like happening in all stages of life (Toga et al 2006) while the structural and cell biological character of the findings is not at all clear in children and adolescents owing to the substantial scarcity of post-mortem information. Information presented above does not indicate, that adolescence could not be also an especially sensitive period of development in the perspective of brain research, because important developmental processes may still happen in the level of interconnections between neurons in the sub-MRI-level. In addition to this, however, eg. according to Shilyansky et al (2010) and Ehninger et al (2008) changes of one gene are a significant factor in the background of learning disorders, but recent research with animal models indicate that these disorders can be influenced radically (with organic chemical compounds) even in adult stage (even in cases of clearly characterized cell biological alterations) without influencing on adolescent development, which is counter intuitive on the basis of prevailing insights of brain maturation in adolescence. On the other hand, there are no other efficient and noninvasive biological measurement methods available for use with humans in this moment. According to Stier (2013) classification of something as a mental disorder cannot even in principle be free of norms and values; whether or not a certain kind of behavior or experience should be classified as disordered is not reducible to brain functions.

5.4 Discussion of study ethics

Systematic reviewing of public research literature does not contain ethical issues comparable with for example clinical experiments and research with laboratory animals, although there may be a danger of confusions of what presented ideas are the writers` and which ideas belong to the authors` of experimental (or like here observational) publications. The object of the study, adolescent mental health is more complicated in this respect. It is true the administration of health affairs in all levels needs information of psychic morbidity among adolescents for planning and financing resources for services of mental health care. However, the information is probably of interest to the tobacco (and alcohol) industry, too. These Industries know, of course, how their own products are sold and what are their trends of consumption, but they may not have a total vision of the market situation only on the basis of sellings (for example do people smoke more cigarettes per day or are there more new smokers). It is generally known that smoking is only seldom begun as an adult. These industries would probably appreciate information of the numbers of young smokers and what kind of adolescents would be the most appropriate targets of marketing, which could be obtained at least partly from this kind of studies. The development of new innovative methods to market drugs is an undesirable possibility, too. It is not out of possibilities that also criminals marketing illegal drugs could as well utilize this kind of information. *Quite obviously limiting publicity of this thesis (as well as other kind of epidemiological studies of adolescent mental health) is worth considering.*

According to Boynton and Greenhalgh (2004) a study is unethical if it is scientifically unsound or wastes people's time or money. The culturally and socially determined character of definitions of mental health as well as the multitude of visions like discussed in the introduction, may question the soundness of the experimental setups in social psychiatric research. Referring to Boynton and Greenhalgh (2004) one may criticize sparse human resources utilized here on ethical grounds, too.

5. CONCLUSIONS

There is not clear evidence of changes in adolescent mental health during the last 10 years in one direction or the other on the basis of repeated cross sectional studies. On the basis of the same kind of studies there is no certainty if such changes ever happen with time in the population level. There is clearly an urgent need of objective measures for measuring changes in mental health, but obviously there is no reason to expect them appear in near future, because MRI-methods are also appearing to be too crude and theoretically unclear for such kind of studies on the basis of the latest studies. There is obviously much to do in international co-operation to increase regional comparability of research findings.

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